

# Multi-Purpose Artificial Muscle and Sensor Array for Untethered Soft Robots

Completed Technology Project (2014 - 2017)



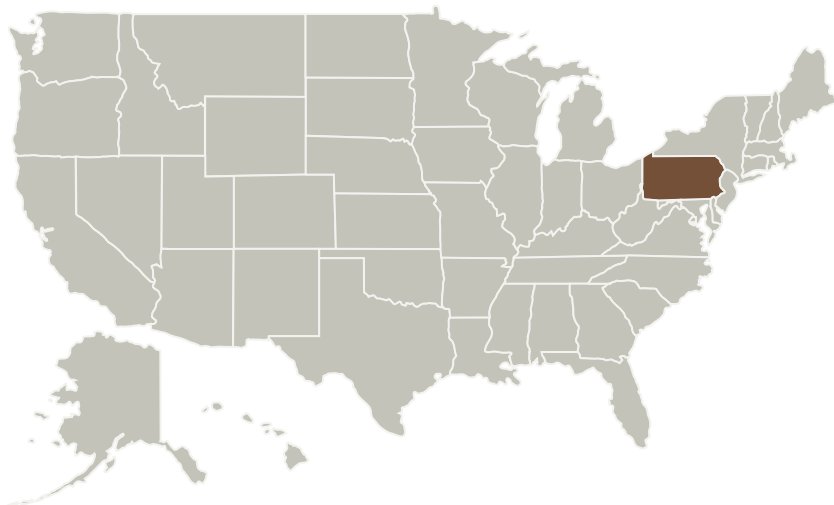
## Project Introduction

"Soft" machines and electronics contain little or no rigid material and remain functional under large elastic deformation. Because they are soft, lightweight, impact resistant, and collapsible, these technologies have the potential to revolutionize robotics for human-machine interaction and space exploration. In this project, my research team and I will accelerate the application of soft machines to space robotics by introducing a "soft robotic tissue" composite embedded with soft elastic sensors, circuit wiring, rigidity-tunable elements, and actuators. These general-purpose elastic films will be millimeters thick and cover a large area. Because the films are soft and stretchable, they can conform to any shape or volume without exerting mechanical resistance. When integrated into clothing, soft robotics, or collapsible structure, the elastic composites can function as "artificial" skin, nervous tissue, or muscle. Potential applications range from strain, pressure, and curvature sensing for shape and contact detection to compact actuators that enable mobility and manipulation without reliance on bulky motors, transmission systems, or pneumatic hardware.

## Anticipated Benefits

Potential applications range from strain, pressure, and curvature sensing for shape and contact detection to compact actuators that enable mobility and manipulation without reliance on bulky motors, transmission systems, or pneumatic hardware.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Carnegie Mellon University	Lead Organization	Academia	Pittsburgh, Pennsylvania

## Primary U.S. Work Locations

Pennsylvania

## Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Carnegie Mellon University

## Responsible Program:

Space Technology Research Grants

## Project Management

## Program Director:

Claudia M Meyer

## Program Manager:

Hung D Nguyen

## Principal Investigator:

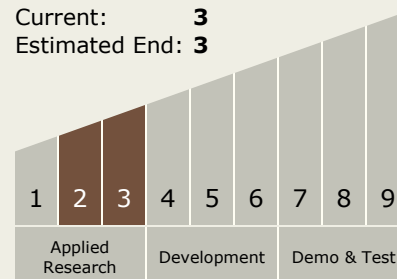
Carmel Majidi

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



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## Technology Areas

### Primary:

- TX04 Robotic Systems
  - └ TX04.1 Sensing and Perception
    - └ TX04.1.1 Sensing for Robotic systems

## Target Destinations

Mars, Others Inside the Solar System